

**EXPLANATION OF SIGNIFICANT DIFFERENCES
KEYSTONE SANITATION LANDFILL SUPERFUND SITE
UNION TOWNSHIP, ADAMS COUNTY, PENNSYLVANIA**

I. INTRODUCTION AND STATEMENT OF PURPOSE

Site Name: Keystone Sanitation Landfill Superfund Site
EPA ID Number: PAD054142781

Site Location: Hanover (Union Township), Adams County, Pennsylvania

Lead Agency: U.S. Environmental Protection Agency, Region III

Support Agency: Pennsylvania Department of Environmental Protection

The United States Environmental Protection Agency (“EPA”) is issuing this Explanation of Significant Difference (“ESD”) for the Keystone Sanitation Landfill Superfund Site (“Site”) in accordance with Section 117(c) of the Comprehensive Environmental Response, Compensation, and Liability Act, as amended (“CERCLA”), 42 U.S.C. Section 9617(c), and Section 300.435(c)(2)(i) of the National Oil and Hazardous Substances Pollution Contingency Plan (“NCP”), 40 C.F.R. 300.435(c)(2)(i). The NCP requires publication of an ESD when modifications to a remedial action, or remedy, selected in a Record of Decision (“ROD”) are necessary, and such modifications significantly change, but do not fundamentally alter the selected remedy with respect to scope, performance, or cost. This ESD has been prepared to provide the public with an explanation of the modifications to the remedy for the Site as selected in the September 30, 1990 ROD, and modified by ROD Amendments issued on June 25, 1999 and September 14, 2000 (“Remedy”).

Specifically, EPA is issuing this ESD to make the following changes to the Remedy:

- Removing the requirement to excavate and place surface soils from the Spray-Irrigation Area below the Landfill cover;
- Adding 1,4-dioxane to the list of Site-related Contaminants of Concern (“COCs”) and establishing 6.4 micrograms per liter (“µg/L”) as the cleanup standard for that contaminant in groundwater, and further describing remedy implementation components and performance standards associated with 1,4-dioxane for groundwater treatment and provision of residential wells;
- Establishing 31 µg/L as the cleanup standard for 1,1-dichloroethane (“1,1-DCA”) in groundwater;
- Establishing 0.84 µg/L as the cleanup standard for 1,1,2,2-tetrachloroethane (“1,1,2,2-PCA”) in groundwater;
- Establishing 2 µg/L as the cleanup standard for mercury in groundwater;
- Requiring a cumulative risk performance standard for all COCs to be conducted after all groundwater cleanup standards have been achieved; and

- Modifying the institutional controls (“ICs”) to extend the restrictions limiting construction and aquifer use to the 70-acre Landfill Property, as defined below, and to establish aquifer use restrictions for certain properties adjacent to the Landfill Property, as identified on Figure 2.

EPA has determined that the above-listed changes to the Remedy are “significant,” as defined by Section 300.435(c)(2)(i) of the NCP, but do not fundamentally alter the Remedy with respect to scope, performance, or cost.

This ESD is supported by an Administrative Record File for the Site. The documents that form the basis for EPA’s issuance of this ESD, as well as the ESD itself, will be incorporated into the Administrative Record File in accordance with Section 300.835(a)(2) of the NCP, 40 C.F.R. § 300.835(a)(2). The Administrative Record File is available for review during normal business hours in information repositories at the following locations:

Hanover Public Library
Library Place
Hanover, PA 17331
(717) 632-5183

EPA Region III
1650 Arch Street
Philadelphia, PA 19103
(215) 814-3157

The Administrative Record File may also be found at any time on the internet at [HYPERLINK "http://loggerhead.epa.gov/arweb/public/advanced_search.jsp"].

II. SUMMARY OF THE SITE HISTORY, CONDITIONS AND REMEDIATION

The source of contamination at the Site is an inactive and privately owned landfill approximately 40 acres in area located at 355 Clouser Road in Hanover (Union Township), Adams County, Pennsylvania (“Landfill”). The Landfill is located in a residential and agricultural area on a 70-acre property, Parcel No. 41K18-0037-000, described herein as the “Landfill Property”, bordered to the north by Clouser Road and to the south by Line Road. The southern boundary of the Landfill Property is located approximately 800 feet north of the Pennsylvania-Maryland border. Structures located on the Landfill Property include an occupied single-family residence and detached garages owned by the Landfill Property owner, a landfill gas flare, and a two-story building that contains components of the groundwater treatment system (see Figure 1 in Attachment A).

From 1966 through 1990, Keystone Sanitation Company accepted household and municipal wastes and certain types of industrial and construction debris, some of which contained hazardous substances. As individual disposal units (cells) were filled with waste, a soil cover was constructed over the closed cells. In 1982, in accordance with Commonwealth of Pennsylvania permitting requirements, groundwater monitoring for volatile organic compounds (“VOCs”) was first conducted. VOC contamination was detected in the on-Site potable well and in a nearby spring located east of the Landfill Property. In 1984, sampling conducted in response to complaints from local citizens identified the presence of low levels of VOCs in some residential wells. Subsequent investigations confirmed this contamination was Site-related.

In 1987, the Site was added to the National Priorities List (“NPL”), the list of uncontrolled hazardous substance releases that are priorities for long-term remedial evaluation and response. In July 1990, EPA completed a Remedial Investigation (“RI”) and Feasibility Study (“FS”), typically referenced as “RI/FS” and conducted concurrently. The RI is the comprehensive data-collection process that determines the necessity for remedial action and supports the evaluation of remedial alternatives. The FS is a study that uses the findings of the RI to thoroughly evaluate remedial alternatives.

In September 1990, EPA signed the ROD specifying the selected remedy for the Site, which included the following components:

- Installation and maintenance of an impermeable cap (constructed of clay, synthetic materials, or a composition of the two) and gas collection system over the 40-acre Landfill;
- Installation and maintenance of groundwater extraction wells and a treatment plant to capture, contain and reduce the concentrations of VOCs and metals in groundwater until Federal Maximum Contaminant Levels (“MCLs”) promulgated pursuant to Section 42 U.S.C. §§ 300f et seq. of the Safe Drinking Water Act and codified at 40 CFR Part 141; non-zero MCL goals (“MCLGs”), or concentrations of “background quality” as specified by Pennsylvania Code, whichever are lowest, were met;
- Provision of a point-of-use groundwater treatment system to residents on the Landfill Property;
- Installation and maintenance of a fence around the Landfill;
- Monitoring of the groundwater in monitoring and residential wells;
- Monitoring of surface water and sediments; and
- Deed restrictions regarding present and future Site activities including ICs limiting construction and aquifer use.

In June 1999, EPA signed a ROD Amendment for the “Groundwater Remedial Action”, or “Groundwater Remedy”, to address migration of Site-related contaminants beyond the Landfill boundaries via groundwater and the potential for the discharge of contaminated groundwater to surface water bodies and adjacent land areas. The 1999 ROD Amendment included the following components:

- The installation and operation of offsite extraction wells to capture, contain, and remediate contaminated groundwater emanating from the Landfill to levels that comply with groundwater cleanup standards;
- Installation of filters for current and future residences located north of the tributary to Piney Creek and within a 0.75-mile radius from the center of the Landfill (a filter will also be installed for one residence located within the 0.75-mile to one-mile radius because of a finding of unacceptable current risk in the risk assessment);

- Annual monitoring of current and future residential wells north of the tributary to Piney Creek and within 0.75 mile to one mile from the center of the Landfill, with the provision of filters for residences within this radius if monitoring shows two consecutive exceedances of any cleanup standard (if filters are provided as part of this remedy, the residence will not be included in annual monitoring);
- Evaluation for inclusion in the monitoring program for homes greater than one mile from the center of the Landfill if Site-related contamination is detected nearby (i.e., within the one-mile border). Provision of filters to such residence if the residential well is adjacent to the one-mile border, within the same hydrogeologic flow path, and two consecutive samples exceed a cleanup standard for a Site-related COC;
- Preparation of a Hydrogeological Evaluation Report after five years of data collection; and
- Sampling of surface water and sediment from local tributaries.

In addition, the 1999 ROD Amendment included modifications to the cleanup standards for COCs in groundwater. CERCLA and the NCP require remedial actions to be protective and attain applicable or relevant and appropriate requirements (“ARARs”). Only those State standards that are promulgated, timely identified and more stringent than federal requirements may be ARARs. The 1990 ROD required that groundwater be remediated until the contaminant levels reach MCLs, non-zero MCLGs or background, whichever were lower. The remediation goal of reaching “background” was based on the Commonwealth requirement in 1990 that contaminated groundwater be cleaned up to background levels. In 1995, the Commonwealth of Pennsylvania signed into law the Land Recycling and Remediation Standards Act, 35 P.S. §§ 6026.101 through 109, also known as “Act 2,” in which it established, among other things, statewide health standards for groundwater, as set forth in 25 Pa. Code § 250.301(a.).

In the 1999 ROD Amendment, EPA eliminated the requirement to clean up to background levels and selected numerical cleanup standards for COCs in groundwater. The cleanup standards were selected from the most stringent of MCLs, non-zero MCLGs, Pennsylvania Safe Drinking Water Act standards or the statewide health standards under Act 2 set forth at 25 Pa. Code § 250.301(a) and Appendix A, Tables 1 and 2. Drinking water standards promulgated by the State of Maryland were considered in selection of cleanup standards due to the proximity of the State to the Site. However, Maryland regulations, set forth at COMAR 26.04.01.06-.07, did not impose any requirements more stringent than Federal MCLs.

The numerical groundwater cleanup standards and basis for selection was identified in the 1999 ROD Amendment. The standards were derived in accordance with the above requirements, including the requirement that remedial actions “at least” attain ARARs and be protective of human health and the environment. The cleanup standards for eight of the 14 COCs were based on a risk-based requirement (“RBR”) determined specifically for the Site. Consistent with CERCLA and the NCP, RBRs were used when ARARs were not available, waived, or were not sufficiently protective.

In September 2000, EPA signed a second ROD Amendment to address the landfill cover type and associated source control measures ("Landfill Remedial Action"). The new component of the Landfill Remedial Action, referred to as the Alternate Source Control Remedy ("ASCR"), involved using a gas extraction system to remove and destroy VOCs and methane from the Landfill. The primary components of the ASCR include:

- Upgrades to the existing Landfill soil cover;
- Installation and operation of an Enhanced Landfill Gas Extraction ("ELGE") system to actively remove VOCs and methane from the Landfill waste;
- Monitoring to ensure proper functioning of the ELGE system and to evaluate VOC removal from the Landfill;
- Monitoring to determine the impact of the ELGE system on the quality of the leachate within the Landfill;
- Use of surface water management controls to minimize soil erosion and sedimentation;
- Maintenance of the existing fence; and
- Specification that the land use restrictions limiting construction and aquifer use applies to the Landfill only and does not extend to other portions of the Site, including those portions of the Landfill Property used for residential purposes.

The upgrades to the soil cover and installation and operation of the ELGE system were selected in lieu of constructing an impermeable cap, as selected in the 1990 ROD. For a complete summary of the Site history and conditions, the public should review the "Site History" section of the ROD and Section II in both the 1999 and 2000 ROD Amendments. Complete versions of the ROD and ROD Amendments can be found in the Administrative Record File, which may be reviewed at the public repositories or via internet resources mentioned previously in Section I of this document.

III. DESCRIPTION OF SIGNIFICANT DIFFERENCES

As described in more detail below, the purpose of this ESD is to: remove the requirement to excavate and place surface soils in the Spray-Irrigation Area below the cover; add 1,4-dioxane to the list of COCs in groundwater and to establish a cleanup standard for 1,4-dioxane and to describe the modified remedy components and performance standards associated with 1,4-dioxane; increase the cleanup standards for 1,1-DCA, 1,1,2,2-PCA and mercury in groundwater; add a cumulative risk performance standard for all COCs in groundwater; and modify the construction and aquifer use ICs for the Landfill Property and establish aquifer use ICs for certain adjacent properties.

A. Change in Disposition of Spray-Irrigation Area Soils

In 1984, in response to elevated concentrations of VOCs in nearby groundwater monitoring wells, the former on-site potable well, and a spring, the Landfill owners installed a spray-irrigation system in the area of highest groundwater contamination at the time (monitoring well K1). Spray-irrigation is the practice of spraying fine droplets of water in the air to expedite volatilization of VOCs. The spray-irrigation system was established around Well K1 on the southeastern portion of the Landfill. Water from the system was sprayed on up to 2.5 acres of a portion of the Landfill and a forested region east of the Landfill (described herein as the "Spray-Irrigation Area"). The Spray-Irrigation Area includes a mature stand of trees that pre-date the Landfill where landfilling activities did not occur. The location of the Spray-Irrigation Area is shown on Figure 1 in Attachment A.

As part of the 1990 RI conducted by EPA, surface soil samples were collected by EPA's contractor, Williams-Russell and Johnson, Inc., from the Landfill at depths of 0 to 6 inches and 18 to 24 inches below ground, including four samples from the Spray-Irrigation Area. Low to trace levels of several VOCs, semivolatile organic compounds ("SVOCs"), pesticides, and inorganic elements were detected in the samples collected from the Spray-Irrigation Area. The ROD required excavation and disposition under the on-Site cap of contaminated surface soils from the Spray-Irrigation Area:

"In addition to covering an area of 40 acres and a volume of 1.7 million cubic yards, the cap will also cover contaminated surficial soils from the spray irrigation area excavated to back ground levels and places [sic] on top of the landfill."

No additional statements, rationales, or explanations regarding this decision were provided in the FS conducted concurrently with the RI, the ROD or elsewhere in the Administrative Record.

The risk determination in the RI as it pertains to Spray-Irrigation Area soils was driven by three contaminants of potential concern: cobalt, manganese, and chromium. To evaluate the merit of excavating soils from the Spray-Irrigation Area, EPA recently reassessed the risk due to these three elements. The reassessment found that the range of concentrations for cobalt and manganese in samples collected as part of the RI were slightly higher than background, but the statistical difference was not significant. The reassessment also found that the concentrations of chromium in the Spray-Irrigation Area soils were less than background. Based on the findings of the risk reassessment, EPA has determined that excavation of soils from the Spray-Irrigation Area and placement beneath the soil cover is not necessary in order to maintain protectiveness of human health and the environment.

B. Modification of Groundwater Cleanup Standards.

1. Addition of 1,4-Dioxane as a Contaminant of Concern and Establishment of Groundwater Cleanup Standard

In modifying the groundwater cleanup standards, the 1999 ROD Amendment provided that as additional Site-specific data is developed for the Site, e.g., through monitoring, the list of COCs and their respective cleanup standards may be modified as determined necessary by EPA, based on its review of the data, in accordance with the NCP. In the early 2000s, EPA became aware that 1,4-dioxane, an organic compound used as a stabilizer in organic solvents and degreasers, was often present at sites, such as this one, where chlorinated VOCs were released. Subsequent routine groundwater sampling has consistently demonstrated the presence of 1,4-dioxane above EPA Region 3 Screening Levels in several extraction wells, perimeter monitoring wells, and down gradient monitoring wells, with concentrations as high as 220 µg/L. 1,4-Dioxane was detected in a sample collected from the potable well that served the Landfill Property residence prior to collapse of the borehole (RW-43) at a concentration of 53 µg/L, and in the potable source of drinking water used afterward (EW-2) at a maximum concentration of 13 µg/L. This ESD modifies the list of COCs and the respective cleanup standards to include 1,4-dioxane since it presents an unacceptable risk.

As discussed in Section II above, the basis for the cleanup standards for the COCs identified in the 1999 ROD Amendment were the lowest of MCLs, non-zero MCLGs, any more stringent requirements of Pennsylvania's statewide health standards under Act 2, as set forth at 25 Pa. Code § 250.301(a) and Appendix A, Tables 1 and 2, or RBRs (see Tables A and B of the 1999 ROD Amendment). Neither a Federal MCL, Federal non-zero MCLG, or State of Maryland standard has been established for 1,4-dioxane. However, under Act 2, Pennsylvania has established a statewide standard for 1,4-dioxane of 6.4 µg/L for aquifers of the type underlying the Site, *i.e.*, used for potable purposes with a total dissolved solids concentration of less than or equal to 2,500 milligrams per liter ("mg/L"), at 25 Pa. Code § 250.301(a) and Appendix A, Table 1.

As a result of this new information, and consistent with the 1999 ROD Amendment, EPA is adding 1,4-dioxane to the list of groundwater COCs and establishing a cleanup standard of 6.4 µg/L for 1,4-dioxane, in compliance with CERCLA and the NCP and in order to be protective of human health and the environment. A description of the components of the selected remedy and performance standards associated with the addition of 1,4-dioxane as a COC are discussed in Section III.D below.

2. Increase of Groundwater Cleanup Standards for 1,1-Dichloroethane, 1,1,2,2-Tetrachloroethane and Mercury

The current groundwater cleanup standard for 1,1-DCA, as established in the 1999 ROD Amendment, is 27 µg/L. No MCL exists for 1,1-DCA. The cleanup standard was based upon the Pennsylvania statewide standard at the time of the 1999 ROD Amendment. Pennsylvania's statewide standard for 1,1-DCA has since been revised from 27 µg/L to 31 µg/L for aquifers of

the type underlying the Site. No drinking water standards have been promulgated by the State of Maryland, at COMAR 26.04.01.07, for 1,1-DCA. EPA, therefore, is increasing the cleanup standard for 1,1-DCA to 31 µg/L. This cleanup standard remains protective of human health and the environment.

The current groundwater cleanup standard for 1,1,2,2-TCA, as established in the 1999 ROD Amendment, is 0.74 µg/L. No MCL exists for 1,1,2,2-TCA. The cleanup standard was based upon the Pennsylvania statewide standard at the time of the 1999 ROD Amendment. Pennsylvania's statewide standard for 1,1,2,2-TCA has since been revised from 0.74 µg/L to 0.84 µg/L for aquifers of the type underlying the Site. No drinking water standards have been promulgated by the State of Maryland, at COMAR 26.04.01.07, for 1,1,2,2-TCA. EPA, therefore is increasing the cleanup standard for 1,1,2,2-TCA to 0.84 µg/L. This cleanup standard remains protective of human health and the environment.

The current groundwater cleanup standard for mercury, as established in the 1999 ROD Amendment, is 0.4 µg/L. The MCL for elemental mercury is 2 µg/L. In the 1999 ROD Amendment, EPA selected the cleanup standard for total mercury based on the possibility that methylmercury, an organic form of mercury, could be present at the Site. Methylmercury does not have an MCL, non-zero MCLG or Act 2 Statewide Standard. Therefore, EPA used an RBR which was based on Site-specific exposure assumptions, to establish 0.4 µg/L as the cleanup standard for total mercury in the ROD Amendment. Recent sampling shows that methylmercury is not present at the Site in concentrations greater than 0.001 µg/L and is not contributing to the total mercury concentrations. Therefore, based on this information, EPA eliminated the need for a cleanup standard based on the presence of methylmercury and instead is setting the cleanup standard for total mercury equivalent to the MCL for elemental (inorganic) mercury of 2 µg/L. The State of Maryland drinking water standard for mercury, as outlined in COMAR 26.04.01.06, is also 2 µg/L. This cleanup standard remains protective of human health and the environment.

3. Summary of Modifications to Groundwater Cleanup Standards

In summary, as explained above, the cleanup standards for COCs in groundwater were specified in the 1999 ROD Amendment. Table A on Page 30 in Section VIII.C of the 1999 ROD Amendment established the groundwater cleanup standards as follows:

Table A
Groundwater Cleanup Standards and Basis

Chemical	Cleanup Standard (µg/L)	Basis #
Trichloroethene	5	MCL
Tetrachloroethene	5	MCL
Vinyl Chloride	1	RBR
1,2-Dichloroethene	25	RBR
1,1-Dichloroethene	3	RBR
1,1,2-Trichloroethane	3	MCLG
1,1,1-Trichloroethane	55	RBR
1,1-Dichloroethane	27	PA Act 2 Statewide Std.
1,2-Dichloroethane	5	MCL
Chloroethane	22	RBR
1,1,2,2-Tetrachloroethane	0.74	PA Act 2 Statewide Std.
Iron	3900	RBR*
Manganese	200	RBR*
Mercury @	0.4	RBR

Abbreviations for basis are: Maximum Contaminant Levels (MCLs), promulgated under the SDWA at 40 C.F.R. §§ 141.11-.12 & 141.61-.62; Maximum Contaminant Level Goals (MCLGs), promulgated under the SDWA at 40 C.F.R. §§ 141.50-.51; or Pennsylvania Statewide Standards for groundwater promulgated under Act 2 § 303 (a) and (b), at 25 Pa. Code § 250.301 (a) & Appendix A, Tables 1 and 2.

* EPA considers PA Statewide Standards under Act 2 § 303(a) and (b), set forth at 25 Pa Code § 250.301(a) & Appendix A-Table 2 (Secondary Contaminants) for iron (300 ug/l) and manganese (50 ug/l) to be relevant and appropriate for the groundwater cleanup at this Site, but is waiving these standards on the grounds that cleanup of the groundwater to those levels would be technically impracticable from an engineering perspective.

@ Risk-based numbers based on methylmercury to ensure protectiveness. Total mercury may include inorganic and/or organic mercury.

This ESD modifies Table A on Page 30 of the 1999 ROD Amendment as follows:

Table A
Groundwater Cleanup Standards and Basis

Chemical	Cleanup Standard (µg/L)	Basis #
Trichloroethene	5	MCL
Tetrachloroethene	5	MCL
Vinyl Chloride	1	RBR
1,2-Dichloroethene	25	RBR
1,1-Dichloroethene	3	RBR
1,1,2-Trichloroethane	3	MCLG
1,1,1-Trichloroethane	55	RBR
1,1-Dichloroethane	31	PA Act 2 Statewide Std.
1,2-Dichloroethane	5	MCL
Chloroethane	22	RBR
1,1,2,2-Tetrachloroethane	0.84	PA Act 2 Statewide Std.
Iron	3900	RBR*
Manganese	200	RBR*
Mercury	2	MCL
1,4-Dioxane	6.4	PA Act 2 Statewide Std.

Abbreviations for basis are: Maximum Contaminant Levels ("MCLs"), promulgated under the SDWA at 40 C.F.R. §§ 141.11-.12 & 141.61-.62; Maximum Contaminant Level Goals ("MCLGs"), promulgated under the SDWA at 40 C.F.R. §§ 141.50-.51; Site-specific Risk-Based Range ("RBR"); or Pennsylvania Statewide Standards for groundwater promulgated under Act 2 § 303 (a) and (b), at 25 Pa. Code § 250.301 (a) and Appendix A, Tables 1 and 2.

* EPA considers Pennsylvania Statewide Standards under Act 2 § 303(a) and (b), set forth at 25 Pa. Code § 250.301(a) and Appendix A-Table 2 (Secondary Contaminants) for iron (300 µg/L) and manganese (50 µg/L) to be relevant and appropriate for the groundwater cleanup at this Site, but is waiving these standards on the grounds that cleanup of the groundwater to those levels would be technically impracticable from an engineering perspective.

C. Addition of Cumulative Risk Assessment Performance Standard for all COCs upon Compliance of Cleanup Standards

At present, the ROD, as amended, does not require an assessment of risk once cleanup standards for all COCs in groundwater are achieved. To ensure that the total risk is within the acceptable range after individual cleanup standards are achieved, EPA is also setting performance standards for the total risk. Therefore, in order to be protective of human health and the environment, upon compliance with cleanup standards in groundwater for all individual COCs, as required by the ROD, as amended, and this ESD, the cumulative risk presented by

those COCs in groundwater must (1) be less than or equal to the upper level of EPA's risk range for carcinogenic substances ($1E-04$, or 1 in 10,000)¹, and (2) be less than or equal to a non-cancer hazard index ("H.I.") value of 1. (The H.I. is the sum of the chemical-specific, target-organ-specific hazard quotients for the COCs.)

Section D.1.b.7 on Page 36 of the 1999 ROD Amendment states:

The groundwater plume shall be pumped and treated until the groundwater cleanup standards set forth in Table A of this ROD Amendment are achieved for all selected COCs at the points of compliance monitoring (extraction wells and related monitoring wells).

This ESD modifies Section D.1.b.7 of the 1999 ROD Amendment as follows:

The groundwater plume shall be pumped and treated until the groundwater cleanup standards set forth in Table A of the 2015 ESD are achieved for all selected COCs at the points of compliance monitoring (extraction wells and related monitoring wells), and the cumulative risk presented by those COCs in groundwater is (1) less than or equal to EPA's level of unacceptable risk of $1E-04$ (1 in 10,000) for carcinogenic substances, and (2) less than or equal to a non-cancer hazard index H.I. value of 1.

D. Description of Remedial Components and Performance Standards Associated with 1,4-Dioxane

The following describes the components of the Remedy and performance standards associated with the modifications of this ESD relating to 1,4-dioxane. Except where modified by this ESD, the requirements and performance standards for the onsite extraction and treatment system (including effluent discharge limitations and air stripper emissions for that system), provision of residential filters and associated monitoring shall continue to be in accordance with the ROD, as amended.

As described in D.1.b. of the 1999 ROD Amendment relating to extraction well performance standards, the extraction and treatment system shall operate until groundwater cleanup standards are achieved for all selected COCs, which will include 1,4-dioxane under this ESD. The concentrations of COCs in system effluent, to include 1,4-dioxane, must continue to meet the requirements of Pennsylvania Water Quality Standards established in 25 PA Code §§ 93.1 et. seq., the Federal Water Quality Criteria established in 51 Fed. Reg. 43665 and the substantive requirements of a PA National Pollutant Discharge Elimination System ("NPDES") permit set forth in 25 PA Code §§ 92.1 et. seq. The system currently discharges approximately

¹The NCP establishes an acceptable risk range for cancer of 10^{-6} to 10^{-4} . See 40 C.F.R. 300.430(e)(2)(A)(i)(2). EPA is setting the standard for this Site at 10^{-4} because the presence of vinyl chloride makes achievement of a more stringent cleanup goal impracticable. Although EPA's point of departure for analysis of an appropriate risk-based standard is 10^{-6} , the preamble to the NCP contemplates site- or remedy-specific circumstances in which EPA may establish a standard higher in the acceptable risk range. See National Oil and Hazardous Substances Pollution Contingency Plan, 55 Fed. Reg. 8666, 8718 (March 8, 1990).

30,000 gallons per day. The Commonwealth of Pennsylvania requires treatment for 1,4-dioxane where the point source discharge is greater than 100,000 gallons per day and the system effluent concentration of 1,4-dioxane is equal to or greater than 100 µg/L. The most recent monitoring results, from 2014, indicate that 1,4-dioxane concentrations were greater than 100 µg/L in only one extraction well (at 110 µg/L in extraction well EW-7). The mean concentration of the samples collected from extraction wells is estimated to be 32 µg/L. Therefore, the concentration in effluent is expected to be below 100 µg/L.

With respect to the components of the Remedy and performance standards for residential filters set forth at D.2.a and D.2.b of the 1999 ROD Amendment, EPA has reviewed numerous possible treatment technologies to address the additional COC, 1,4-dioxane. In the 1999 ROD Amendment, EPA had evaluated, for cost estimating purposes, two types of potential filters which may have been installed: granular activated carbon (“GAC”) units and reverse osmosis (“RO”) units (the latter limited to those homes with groundwater contaminants exceeding cleanup standards for Site-related metals). The appropriate type of filter to be installed in each affected household was to be determined during remedial design. Likewise, for cost estimating purposes for this ESD, EPA has identified two types of treatment technologies which could be used to mitigate 1,4-dioxane contamination in residential potable water to concentrations below 6.4 µg/L, to be determined during the remedial design phase.

The following technologies can all be applied *ex situ* and installed in an in-line configuration:

Activated carbon is commonly used to adsorb natural organic compounds in contaminated drinking water. Adsorption is both the physical and chemical process of accumulating a substance at the interface between liquid and solid phases. Activated carbon is an effective adsorbent because it is a highly porous material and provides a large surface area to which contaminants may adsorb. GAC, currently employed at the Site, is the most common type of activated carbon treatment used to treat organic compounds in residential water systems. While 1,4-dioxane only mildly adsorbs to particulate matter, case studies report effective mitigation of the compound using GAC under certain conditions. In some situations, enhancement of a typical GAC treatment system may be required, with modifications to include an increased dosage of activated carbon, a specific grade of GAC (e.g., coconut-shell based) designed for removal of poorly adsorbable organic compounds, increased exchange frequency, and increased contact time or reduced flow.

Chemical oxidation is a technology proven to destroy many organic compounds, including 1,4-dioxane. Ozone, also known as triatomic oxygen or O₃, combined with ultraviolet (“UV”) light, is a technology that destroys 1,4-dioxane molecules by using chemical oxidation. Ozone is injected into the water after withdrawal from the well. The ozone/water mixture is then exposed to UV light to produce hydroxyl radicals (OH[•]), which are strong oxidizers that destroy 1,4-dioxane. A residential system would likely include a particulate filter, biological filter, an ozone/UV system, and a carbon filter.

To date, the only detection of 1,4-dioxane in a potable source has occurred on the Landfill Property. No potable wells in the vicinity of the Landfill have contained 1,4-dioxane. Moreover, based on the known extent of 1,4-dioxane in groundwater, no wells other than the potable well on the Landfill Property are anticipated to exhibit the compound in the future. Therefore, for cost estimating purposes, EPA has assumed that only one residence will potentially require a filtration system for a potable water supply to protect against the risk of ingesting groundwater contaminated with 1,4-dioxane. The capital cost has been estimated to be \$6,000 and the annual maintenance costs are estimated to be \$1,000. The increased cost to address 1,4-dioxane in residential wells is marginally higher than filtration systems required by the ROD, as amended, due to the potential for the increased costs for installation, maintenance and monitoring. Any increased cost may be mitigated by the fact that GAC filtration systems, if determined to be appropriate to mitigate 1, 4-dioxane contamination at this Site, may already be installed at the affected residence.

E. Modification and Establishment of Institutional Controls

The 1990 ROD required the implementation of deed restrictions to insure that future property owners would not “misuse the Site”; furthermore, “restrictions on property use would include aquifer use limitations and limitations on construction.” Although the 1990 ROD called for deed restrictions, it did not specify the exact location where the restrictions were to be placed. Accordingly, the 2000 ROD Amendment modified the Remedy to specify that the deed restrictions would be limited to the Landfill, and would “not extend to other portions of the Site, including those portions of the Site used for residential purposes.” This ESD further modifies the Remedy to extend restrictions limiting construction and aquifer use to the entire Landfill Property and to establish aquifer use restrictions for certain properties adjacent to the Landfill Property, as identified on Figure 2.

EPA has determined that modifying the Remedy to limit construction and aquifer use on the entire Landfill Property and to establish aquifer use restrictions for certain properties adjacent to the Landfill Property is necessary to ensure long-term protection of human health and the environment. The Landfill Property restrictions are necessary to protect the integrity of the remedial measures and to avoid interference with groundwater plume control conducted as part of the Remedy at the Site. In addition, the restrictions will assist in preventing exposure to contaminated groundwater via ingestion, inhalation, or dermal contact since Site-related COCs have been found at levels above cleanup standards in groundwater at the Landfill Property. Furthermore, the implementation of restrictions on those properties adjacent to the Landfill Property, which are specifically identified on Figure 2, is also necessary to prevent exposure to contaminated groundwater because Site-related COCs have been found in groundwater at those properties above cleanup standards.

Accordingly, EPA is modifying the Remedy to add the following components:

1. Prohibit construction and all other activities on the Landfill Property that would in any manner 1) disturb or interfere with the performance of the Remedy and components of the Remedy, including, but not limited to, the soil

- cover, landfill gas wells, flare, groundwater extraction or monitoring wells, groundwater treatment building, conveyance piping, perimeter fencing, and any other infrastructure associated with the Remedy, or 2) limit access to the Landfill Property, unless it is demonstrated to EPA that such activity will not in any manner disturb or interfere with the Remedy or pose a threat to human health or the environment and EPA provides prior written-approval for such activity.
2. Prohibit installation, refurbishment, redevelopment and pumping of any new or existing groundwater wells on the Landfill Property for any purpose unless it is demonstrated to EPA that such activity will not in any manner disturb or interfere with the Remedy or pose a threat to human health or the environment and EPA provides prior written-approval for such activity.
 3. Require 30-day prior notification to EPA of all plans to install, refurbish, redevelop, and/or pump any new or existing groundwater wells on properties adjacent to the Landfill Property and within 500 feet of the identified plume, as identified on Figure 2 in Attachment A.

The above restrictions and requirements will be implemented by use of one or more institutional controls, such as easements, restrictive covenants, common law and/or statutory covenants or easements, or Federal or State orders or agreements. The restrictions and requirements may also be implemented through governmental controls such as local ordinances, regulations, or zoning restrictions. Informational devices, such as title notices, public advisories, public meetings or informational mailings, may also be used to implement the above restrictions and requirements at the Site. The restrictions and requirements regarding aquifer use will be implemented and shall remain effective for as long as COCs in groundwater exceed their respective cleanup standards.

The Remedy, as modified by this ESD, will continue to provide protection to human health and the environment.

IV. SCOPE, PERFORMANCE, AND COST

The changes outlined in this ESD do not fundamentally change the scope, performance, or cost of the remedial action. EPA expects that the modification to the disposition of the Spray-Irrigation Area soils will have a negligible impact on the scope and performance of the Remedy, while reducing the overall cost estimate in the 1990 ROD. Changes to the groundwater cleanup standards and performance standards are expected to negligibly impact scope, performance, and cost. All modifications outlined in this ESD are expected to continue to maintain protectiveness of human health and the environment.

V. COMMUNITY INVOLVEMENT

In accordance with Section 117(d) of CERCLA, 42 U.S.C. § 9617(d), and Section 300.435 of the NCP, 40 C.F.R. § 300.435, EPA provided the public with an opportunity to comment on the ESD during a thirty (30)-day public comment period which began on July 21, 2015 with the publication of the notice in the Hanover *Evening Sun*, and closed on August 20, 2015.

The Administrative Record File for the Site includes the documents that form the basis for this ESD. The Administrative Record File is available for public review at the locations provided on page 2.

VI. SUPPORT AGENCY REVIEW

In accordance with 40 C.F.R. § 300.435(c)(2), EPA notified the Pennsylvania Department of Environmental Protection (“DEP”) of the proposed modifications to the Remedy. In correspondence dated July 15, 2015, DEP concurred with the proposals set forth in this ESD. Although not the designated support agency, the Maryland Department of the Environment (“MDE”) was also notified of the proposed modifications due to the proximity of the Site to the State of Maryland. In correspondence dated February 26, 2015, MDE concurred with the proposals set forth in this ESD.

VII. AFFIRMATION OF STATUTORY DETERMINATIONS

EPA has determined that the modified remedy as described in this ESD complies with the statutory requirements of Section 121 of CERCLA, 42 U.S.C. § 9621. EPA believes that the Remedy, as modified by this ESD, will remain protective of human health and the environment, be cost-effective, and meet the Federal and State requirements that are applicable or relevant and appropriate to this Remedial Action.

Cecil Rodrigues, Director
Hazardous Site Cleanup Division

Date

Appendix A

Figures

Explanation of Significant Differences Keystone Sanitation Landfill Superfund Site

September 2015

Appendix B

Responsiveness Summary

Explanation of Significant Differences
Keystone Sanitation Landfill Superfund Site

September 2015

**RESPONSIVENESS SUMMARY
EXPLANATION OF SIGNIFICANT DIFFERENCES
KEYSTONE SANITATION LANDFILL SUPERFUND SITE
UNION TOWNSHIP, ADAMS COUNTY, PENNSYLVANIA**

Background

On July 21, 2015, EPA announced the opening of a 30-day public comment period on its proposed modifications to the Remedy for the Keystone Sanitation Landfill Superfund Site (“Site”). EPA described the proposed modifications in an Explanation of Significant Differences (“ESD”). The comment period was held from June 21, 2015 through August 20, 2015. During the public comment period, EPA received comments from two interested parties. Those comments, along with EPA’s responses to the comments, are summarized below.

Comments were submitted to EPA by de maximis, inc. on behalf of the Original Generator Defendants (“OGD”). Golder Associates Inc. also submitted a letter on behalf of Waste Management of Pennsylvania, Inc. and Waste Management of Maryland, Inc. (part of the Owner/Operator respondents) supporting EPA’s decision regarding the spray-irrigation soils. Both of these comment letters have been added to the Administrative Record file for the Site. After considering the comments received, EPA determined that it was not necessary to make any changes to its proposed modifications to the Remedy as published in the July 21, 2015 Proposed ESD. The comments made on behalf of the OGD, with responses from EPA, are provided below.

A. Comments submitted by de maximis, inc. on behalf of the Original Generator Defendants (“OGD”), dated August 20, 2015:

OGD Comment #1:

The OGDs request that EPA propose a corresponding leachate standard for 1,4-dioxane. By adding 1,4-dioxane exclusively to the list of groundwater COCs, without including a corresponding leachate standard or other source control mechanism to address this compound, EPA has impermissibly transferred source control responsibility from the Owner/Operators to the OGDs, without regard for each Consent Decree’s terms. The OGDs’ September 10, 1999 Consent Decree with EPA at ¶ 23n., defines the OGDs’ groundwater remedial action as specifically excluding “control of sources of contamination at the Site”. Paragraph 17 of the Owner/Operators [Consent Decree] “will perform the portion of the remedial action at the Site relating to the source of contamination.”

Consistent with both Consent Decrees, the Alternate Source Control Remedy’s gas extraction remedy (ELGE) system should be required to address and remediate the source of 1,4-dioxane. In addition the ELGE system, or a more effective alternate source control remedy, should be required to address all other continuing sources of contamination to groundwater, by focusing on leachate quality.

EPA Response:

EPA has determined that it is not practicable at this time to select a leachate standard or ELGE performance standards for 1,4-dioxane. Establishing ELGE performance standards for 1,4-dioxane is impractical due to its low Henry's Law constant and vapor pressure, which limit the volatility of 1,4-dioxane and restrict transformation from the liquid to the gaseous phase. These characteristics have also restricted laboratory analyses of 1,4-dioxane in the gaseous phase, so it is not clear how this compound could be monitored in the ELGE system. With respect to the selection of a leachate standard for 1,4-dioxane, EPA notes that the OGDs have recently submitted a series of recommendations regarding leachate collection and ELGE performance standards, and the Owner/Operators are in the process of preparing a response. EPA is currently reviewing those recommendations and intends to meet with the performing parties to further discuss this matter. EPA will consider all data collected to support the feasibility of adding additional, or enhancing current, leachate monitoring points. After EPA conducts its review, it will[SEQ CHAPTER \h \r 1] evaluate whether it is appropriate to modify the leachate collection and ELGE performance standards.

Lastly, the ESD does not address performance under the existing Consent Decrees. Rather, the ESD ensures that the Remedy, as modified, remains protective of human health and the environment and meets the Federal and State requirements that are applicable or relevant and appropriate ("ARARs") to this Remedial Action.

OGD Comment #2:

The OGDs request clarification of why the OGDs must meet groundwater standards, in addition to a cumulative risk assessment, when EPA's Technical Support Branch has already stated in its April 16, 2013 memorandum, "Keystone Sanitation Landfill: Reevaluation of Performance Standards" ...that the proposed updated performance standards, even with the addition of 1,4-dioxane at 9 µg/L, fall within EPA's acceptable risk range for cancer.

In addition, the OGDs request that EPA change the ESD's proposed requirement on page 11 from achieving groundwater standards "and" a cumulative risk assessment, because the current source control remedy is not addressing the continuing sources of contamination to groundwater, including 1,4-dioxane. Without EPA's imposition of (1) storm water infiltration controls; (2) rigorous leachate monitoring; and (3) leachate sampling to determine the extent of 1,4-dioxane, as well as directing the Owner/Operators to remove the sources of 1,4-dioxane and other COCs to prevent the Landfill from re-contaminating groundwater, 1,4-dioxane will not reach EPA's proposed standard of 6.4 µg/L within the foreseeable future.

EPA Response:

40 CFR § 300.430(f)(1)(A) requires that remedies be protective of human health and the environment. EPA has determined that it is appropriate to evaluate individual risk posed by each COC as well as the cumulative risk posed from multiple COCs. Even if the performance standard for each COC is achieved, there still may be an unacceptable risk posed by the cumulative effect

of the residual concentrations of COCs. As stated in the comment, the comprehensive risk presented by COCs, including 1,4-dioxane, would currently fall within EPA's acceptable risk range for cancer (and the HI would be less than 1). Nonetheless, the addition of the cumulative performance standard, ensures that the risk assumptions in the future, when all cleanup standards have been met in a particular well, remain protective.

OGD Comment #3:

In light of EPA's concern about extending restrictions on aquifer use, and the 2000 ROD Amendment's goal that the ELGE system would prevent the migration of contaminants in excess of performance standards, EPA should re-assess the leachate standards as they apply to the groundwater remedy's ability to achieve its performance standards, particularly at the groundwater extraction wells that surround the Landfill's boundary.

Currently, leachate detected in a leachate monitoring point located at or near the waste boundary is allowed to have COC concentrations two to twenty times greater than the groundwater cleanup standards; moreover, the COC concentrations are permitted to decline to the groundwater cleanup standards, via natural attenuation processes, at a distance two hundred feet from the waste boundary.

The groundwater remedy, by contrast, is required to achieve the groundwater cleanup standards at points of compliance (extraction wells and related monitoring wells) at distances that are much less than 200 feet from the landfill. EW-6 and EW-7, for example, are located approximately 20 to 25 feet from the waste limit.

As noted above, on July 27, 2015, the OGDs forwarded a series of recommendations to EPA designed to help EPA conclude that the current ELGE system is unable to meet the 2000 ROD Amendment's goal that it prevent the migration of site-related contaminants that are causing groundwater contamination in excess of performance standards. If the results of this recommended expansion of the leachate monitoring program indicate that the leachate performance standards do not prevent the migration of contaminants, including 1,4-dioxane, from the Landfill in excess of the groundwater performance standards at all of the groundwater compliance points, EPA will have the data needed to direct revisions to the current leachate standards. The OGD request that EPA obtain this essential data as quickly as possible, prior to the implementation of any of the changes proposed in this 2015 ESD.

EPA Response:

EPA has acknowledged that the presence of leachate may be contributing to the lack of continual decline in groundwater concentrations at some regions of the Landfill. Currently, performance monitoring includes semi-annual sampling of two leachate monitoring points. Liquid has been absent during all monitoring events in one leachate monitoring point, and has been present only a few times in the other monitoring point. EPA believes that these data may be insufficient to evaluate trends in leachate occurrence and quality. As discussed in EPA's response to Comment #1, EPA intends to discuss with the performing parties the feasibility of adding additional or

enhancing the current leachate monitoring points. After EPA evaluates the available information, it will[SEQ CHAPTER \h \r 1] take the appropriate next steps, as necessary, to protect human health and the environment.

EPA disagrees that it should evaluate the feasibility of adding additional or enhancing the current leachate monitoring points before it implements the modifications to the Remedy, as described in the Proposed ESD. EPA has determined that those modifications are necessary to protect human health and the environment and are appropriate to implement at this time.

OGD Comment #4: *Although the OGDs are under no obligation to do so, they currently provide the sole Landfill residence with water from groundwater extraction well EW-2. The water is treated by a Residential Filtration Unit (RFU), which the OGDs installed at the residence. Should 1,4-dioxane levels in EW-2 exceed 6.4 µg/L after treatment by the RFU system, the OGDs will stop providing water from EW-2 to the Landfill residence, and ask EPA to notify the resident to find an alternative source.*

EPA Response: EPA concurs that the OGDs are not required to provide or maintain a ground water well for use as a source of water to any residents. Please note that if the OGDs stop providing the resident of the Landfill Property with potable water from extraction well EW-2, the resident may install a new drinking water well, subject to EPA approval. If the resident of the Landfill Property does install a new drinking water well, because the Remedy requires treatment of all residential wells that are hydrogeologically connected to the Landfill until the completion of the groundwater extraction and treatment program, the OGDs will be required under the Consent Decree, Civil Action No. 1-CV-93-1482, to treat water extracted from that well with an RFU. EW-2 has contained concentrations of 1,4-dioxane no higher than 14 µg/L. Given the low concentrations of 1,4-dioxane found in EW-2 to date, EPA believes that the current RFU has the potential to effectively reduce 1,4-dioxane to levels below the 6.4 µg/L cleanup standard.

OGD Comment #5: *In the 1999 ROD Amendment at page 34, EPA “estimated, for cost purposes only, that [groundwater] remediation will take approximately fifteen years.” The addition of COC 1,4-dioxane at 6.4 µg/L will greatly extend the time and increase the costs of the OGDs’ groundwater remediation responsibilities.*

The OGDs’ remedial progress has already been severely hampered and their remedial costs significantly increased due to the ELGE remedy’s porous soil cover, its inattention to leachate monitoring and collection, and its inadequate coverage of the Landfill mass. Now, EPA has increased the OGD’s burden by failing to require the ELGE system to remove the sources of 1,4-dioxane contamination, and by failing to add 1,4-dioxane to the ELGE remedy’s performance standards. Although the Owner/Operators originally informed EPA that they believed “ELGE will be more cost effective than capping and will result in lower costs to the PRPs,” 1999 ROD Amendment Comments § B, ¶ 6, the ELGE remedy has not produced these promised results. The only costs that have remained low are the Owner/Operators’. In summary, the ELGE system’s failure, coupled with EPA’s transfer of 1,4-dioxane remediation responsibility to the OGDs, will substantially increase the scope, performance, and costs of the OGDs’ remedial performance.

EPA Response:

The Fourth Five-Year Review for the Site, completed on September 15, 2015, found that the Remedy, including the source control components, were protective of human health and the environment in the short term. However, as discussed in EPA's responses to Comments #1 and # 3, EPA found in the Review that long-term issues related to the source control portion of the remedy may exist, and intends to evaluate the feasibility of adding additional or enhancing the current leachate monitoring points. In the meantime, EPA has determined that adding 1,4-dioxane to the list of COCs is necessary to protect human health and the environment. Further, while EPA recognizes that the addition of 1,4-dioxane as a COC may increase the costs of the Remedy; however, EPA has determined that such increase will not be significant. EPA's overall cleanup approach for the Site has not changed with the issuance of the ESD.

B. Comment submitted by Golder Associates Inc. (Golder) on behalf of Waste Management of Pennsylvania, Inc. and Waste Management of Maryland, Inc, Owners/Operators at the Site

Golder Comment #1:

A review of the 1990 ROD, Figure 8, shows the approximate location of the former spray irrigation area along the easternmost edge of the site, although the limits are poorly defined on the figure. Subsequently, several documents were submitted by the Respondents in 1997 through 2000 which ultimately resulted in issuance of the September 2000 ROD Amendment that presented the Alternate Source Control Remedy modifying the proposed remedy in the 1990 ROD. Based on Golder's research through its files, minutes from an April 1, 1998 meeting with the USEPA indicated that it was agreed that the excavation of the Spray-Irrigation Area soils would not be required and instead could be covered in place. That meeting was attended by Mr. Chris Corbett, Ms. Ruth Scharr and Ms. Michelle Simon of USEPA, and Mr. Steve Finn of Golder. Although the 1990 ROD required excavation of these soils, the USEPA did not consider this a significant change to the remedy. The 2000 ROD Amendment did not address the Spray Irrigation Area.

As stated in a letter from Golder to the USEPA on May 16, 2011, the pre-design investigation (PDI) performed by Golder in April and May 2002 included an inspection of the existing cover system, including soil borings to determine cover soil thickness and extent of waste. The existing soil cover thickness was found to be in excess of 5 feet along the eastern site boundary in the portion of the site identified as the Spray Irrigation Area in the 1990 ROD. Based on the results of this PDI, no upgrades to the cover in this area of the site were proposed in the Final (100%) Design Report (FDR), OU-1 Alternate Source Control Remedy, Keystone Sanitation Landfill, Union Township, Adams County, Pennsylvania, prepared by Golder, dated June 2002. This FDR was approved by the USEPA in a letter dated August 5, 2002. Based on these facts and the results of the risk reassessment related to the Spray Irrigation Area presented in the Proposed ESD, the [OU-1] Respondents fully concur that no further action is warranted in this area.

EPA Response:

EPA appreciates Golder's input. For purposes of clarification, EPA determined that it was appropriate to leave spray-irrigation soils in place because based on the findings in a risk assessment conducted by EPA in October 2011, those soils do not pose an unacceptable risk to human health or environment.

[SEQ CHAPTER \h \r 1]